

NEWMARK (L.)

LEAD-PALSY IN CHILDREN

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SINCE Dr. J. J. Putnam, in his contribution to Keating's *Cyclopaedia of the Diseases of Children*, about four years ago, commented on the apparent rarity of lead-palsy in children and the desirableness of more material with which to test certain conclusions suggested by the facts already published, there have been but scanty additions to the literature of the subject. Stieglitz,<sup>1</sup> writing in 1892, was hampered in an important argument by the lack of records concerning saturnine paralysis in children. Dr. Wharton Sinkler reported three new cases in THE MEDICAL NEWS of last year, but was unable to add any published cases to those comprised in Putnam's table. Putnam himself, however (in a note in the *Boston Medical and Surgical Journal* of February 23, 1893), mentioned another case that had been reported by Sinclair White.<sup>2</sup> The patient in this instance was a girl, aged eight years, who was poisoned by drinking-water. Besides a faint blue line she presented "paresis of the extensor muscles of the hands and of the flexors of the feet. The

<sup>1</sup> Archiv für Psychiatrie, Bd. xxii.

<sup>2</sup> British Medical Journal, 1890, i, p. 18.



latter, owing to pointing of the toes, compelled the patient to lift the feet high off the ground."

The following briefly reported cases are all I have been able to glean from the records: Brown,<sup>1</sup> of Bacup, observed a child, aged four years, with a dark-blue line on the gums, severe colic, obstinate constipation, painful micturition, and marked anemia. It had tremor of the legs, and this was followed by paresis, and ultimately paralysis. Recovery was slow.

Oliver's book<sup>2</sup> contains the account of a girl, over three years old, who had received daily from early infancy a small quantity of botanic beer which was carried through forty feet of lead pipe. She was very anemic, had a blue line on the upper gum, could not talk or even walk well, and there was "a good deal of staggering as in locomotor ataxia." The knee-jerks were absent. This child died in a few months of convulsions.

Despite the meagerness of the descriptions, the implication of the nervous system in these cases is evident, and they may at least serve to illustrate that proneness of the lower extremities to suffer which has been observed in other instances.

A case of Oppenheim's, reported by Anker<sup>3</sup> may not be relevant, as the paralysis could not be attributed to direct lead-poisoning, but was considered to be probably hereditary saturnine palsy, the father of the patient being a compositor and having suffered repeatedly from lead-colic, but not from par-

<sup>1</sup> Unsuspected Lead-poisoning in Children. *British Medical Journal*, 1890, i, p. 177.

<sup>2</sup> On Lead-poisoning, p. 177.

<sup>3</sup> *Berliner klinische Wochenschrift*, 1894, p. 577.

alysis. The daughter became mentally weak after sustaining an injury to the head in her third year. At about the age of seven years progressive weakness of both lower extremities set in ; when examined a year later there was paralysis of the extensors of the feet and toes, except the anterior tibial muscles ; in the course of the next six months this exception disappeared, and there was also degenerative paralysis of the muscles supplied by the radial nerve, the supinator longus and triceps escaping, and of some of the intrinsic muscles of the hand. Subsequently considerable improvement took place in the condition of the upper limbs, but none in the lower, and the calf-muscles were also slightly implicated. In his commentary on this case Anker observes that lead-palsy of the lower extremities is rare, and that the order in which the lower and upper limbs were affected differs from the usual sequence. While these statements are true as far as adults are concerned, the study of lead-palsy as it occurs in children has hitherto resulted in the conclusion that what Anker deems exceptional would seem to be the rule in these cases. This conclusion is, at least partly, confirmed by the following case which has been under observation at the San Francisco Poly-clinic since the 27th of January, 1894.

The patient is a girl, now eight years of age. During a considerable period preceding her first visit she suffered repeatedly from disorders of the stomach and bowels, which were treated as attacks of ordinary "indigestion." In November, 1893, she was again seized with vomiting, constipation, and pain in the abdomen ; her breath was very foul, and she could retain nothing in her stomach but milk

and lime-water. On the first of December she took to her bed, and two weeks later her mouth became very sore; her medical attendant states that "she was suffering with the worst case of aphtha he ever saw." The girl left her bed on the 23d of December, 1893, but on first attempting to walk she fell; soon, however, she regained more control over her legs, so that she was able to walk. While still confined to bed the position of her hands and her manner of grasping objects attracted attention.

It was at first declared that the girl had had no opportunity of coming in contact with lead; but inquiry easily elicited the information that the crib in which the child slept had been painted in the summer or fall of 1892 with a mixture of paints containing white lead; it had not been varnished. This covering of paint was very slow in drying, requiring, indeed, many months to do so, and the patient used to scratch it off with her finger-nails.

In January, 1894, the patient was found to be anemic, but not emaciated. On the upper and lower gums there was a well-marked blue line. The second dentition was in progress, and a small quantity of tartar had formed on the teeth. There was bilateral wrist-drop. On the right side all the muscles supplied by the radial nerve were paralyzed, except the triceps and supinator longus; on the left side the triceps, supinator longus, and abductor pollicis longus were preserved. Fibrillary twitchings were absent, but a jerky tremor was observed. The triceps-reflex was present in either arm. Sensibility was intact. The affected muscles gave the complete reaction of degeneration.

The patient was able to walk, but she occasionally stumbled, owing to her failure to clear the ground completely, for there was bilateral ankle-drop. She could, however, extend the proximal phalanges of the toes quite well. This extension of the toes was the

only movement she could execute with the muscles supplied by the external popliteal nerve. The anterior tibial muscle was affected like the others. The knee-jerks and ankle-jerks were normal. The plantar reflex was faint in either foot. In response to faradic and galvanic excitation of the external popliteal nerve only extension of the toes occurred. This effect was produced also with either current by applying the electrode at the ankle midway between the malleoli, or (less readily) on the dorsum of the foot; but the contraction thus produced was rather sluggish. Direct faradization of the muscles of the lower leg gave a negative result—the constant current elicited the reaction of degeneration. Various muscles of the upper arm, shoulder, and thigh reacted to the tests in a normal manner.

Improvement soon began in the upper extremities, and by the middle of April, 1894, the patient had regained the use of her hands. It was not until the end of June that a tendency to improvement was observed in the legs; since then progress has been steady but slow, and recovery is not yet complete. At present (over a year after the onset of the palsy), while all the muscles of the forearms contract perfectly to voluntary impulses, the electric reaction of those which have been affected is still abnormal. Their responses to indirect and especially to direct stimulation are more or less feeble, the diminution of irritability being a little greater in the right forearm than in the left, but they show no modal changes.

Dorsal flexion of the feet is still defective, and the tendency to assume the equinovarus position is noticeable, although there has been a great amelioration in their condition. The toes can be strongly extended. The muscles of the lower leg respond to excitation of the external popliteal nerve with moderate faradic and galvanic currents, but an increase in the strength of the current is not followed by

a corresponding increase in muscular contraction. The direct irritability of the muscles is greatly diminished—that of the peronei more than that of the others. Extension of the toes may be produced in the same manner as formerly. Segments of the blue line are faintly discernible on the upper and lower gums.

Putnam<sup>1</sup> says concerning lead-palsy in children: "In every instance that the writer has found described or seen, the legs have been affected as much as the arms, or more, as in paralysis from alcohol and arsenic, the symptoms generally appearing first in them." The foregoing case again illustrates the liability of the lower extremities to suffer. The supinator longus escaped in the upper limbs; but the tibialis anticus, which usually escapes when the legs are involved, was affected. In none of the available records of cases relating to children was it clearly stated that this muscle had escaped.

The preservation of the power of extending the toes is noteworthy. This function devolved upon the short common extensor. No sign of action in response to the will or to electricity could be distinguished in the long extensor; the point over the ankle whence the extension of the toes was provoked is the motor point of the branch of the nerve supplying the short common extensor. This muscle is a more powerful extensor of the toes than the long one, the latter, according to Oppenheim,<sup>2</sup> being chiefly a dorsal flexor of the foot, besides raising its outer border and abducting it. I have not found mention elsewhere of this functional integrity of the

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<sup>1</sup> Keating's Cyclopedias, vol. iv, p. 626.

<sup>2</sup> Lehrbuch der Nervenkrankheiten, pp. 24 and 25.

short common extensor of the toes in cases of lead-poisoning implicating the external popliteal nerve. The sluggish contraction to both currents indicates, however, that this muscle did not entirely escape the action of the poison.

As the patient was confined to her bed at the onset of the paralysis, the trouble in the legs probably remained unnoticed for some time, and it cannot, therefore, be determined whether the lower extremities were affected before the upper, as seems to be the rule in children. Sinkler's patient, Sarah McD., presented in her first attack an example of this precedence, and three of the cases in Putnam's table exhibited the same order of progression. It is nowhere mentioned that the palsy appeared first in the arms.

It will be observed that, although the arms and the legs were equally affected, functional recovery took place much earlier in the former than in the latter. This occurred also in two of Chapin's cases and in one of Sinkler's. It does not appear from the literature, as far as it is accessible to me, that in any case the disorder has persisted in the muscles of the upper extremities after complete recovery of the lower.

Stieglitz, in his experimental researches, succeeded in producing saturnine paralysis in animals, but failed to obtain the type characteristic of lead-poisoning in the human adult. Adopting the suggestion of Moebius, that excessive use of a group of muscles may determine the localization of the palsy, Stieglitz concludes that localized paralysis must not be expected in animals, as no special group of muscles in them is subject to a particular strain; and he

adds that children, being comparable in this respect to animals, the localization of their paralysis is just as likely to be atypic; and Putnam,<sup>1</sup> remarking that it is as common to find paralysis of feet and legs as of arms in children poisoned by lead, says: "The natural conclusion is that in childhood the influence of greater and more complex use has not made its appearance to increase the susceptibility to disease of the neuro-muscular apparatus of the upper extremity."

Now, the assumption that lead-palsy in children follows no type is erroneous; the special tendency of the extensors to suffer is about as marked in them as in adults, the localizing influence, however, predominating in the lower extremity. This predominance seems well established; yet it does not necessarily follow that the upper limbs in children are less susceptible than in adults, but rather that the lower are more so. Is this to be ascribed to "greater and more complex use" of the child's foot?

The theory of the relation of muscular function and the selective action of lead has been employed chiefly to explain certain deviations from the ordinary type of paralysis, such as have been observed in file-cutters, for instance; it does not seem to suffice for typical cases in which the neuro-muscular apparatus has not been subjected to excessive exertion.

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<sup>1</sup> Boston Medical and Surgical Journal, February 23, 1893.



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